A Preliminary Phytochemical Survey in the British Solomon Islands

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DURING 1964 and 1965, while the author was engaged on a project at Honiara, capital of the British Solomon Islands, the opportunity was taken to carry out a preliminary survey of the flora for the presence of alkaloids and saponins.

The Forestry Department at Honiara is actively engaged in establishing a herbarium, but all the specimens collected for the herbarium are placed in ethanol. Such specimens are of no value for chemical tests.

It was necessary, therefore, for the author to collect plant material for this survey. Most of this material came from the main island of Guadalcanal. A sample of most of the specimens collected was lodged with the Herbarium at Honiara under the author's name and collection number. This number is listed in the Table of Results, so that any interested person may obtain, by application to the Chief Forestry Officer, Honiara, verification of the genus and species and the date and place of collection.

The author is indebted to Dr. T. C. Whitmore, Forest Botanist, and Mr. G. Dennis, Herbarium Officer, both of the Forestry Department, Honiara, B.S.I.P., for their assistance in the problems of nomenclature, and to Mr. J. Berry of Honiara, who introduced him to jungle trails.

PRELIMINARY TESTING

Prior to departure from Sydney, some preliminary work was carried out on Australian flora to check the methods of extraction and the precipitating reagents for spot-testing. Following suggestions by Henry (1929), chopped-up plant tissue was extracted with mildly alkaline ether, petrol ether, chloroform, and ethanol, and also with Prollius fluid and hydrochloric acid (1% aqueous).

Of these solvents hydrochloric acid gave most consistently the best concentration of alkaloid. It also had the great advantage of simplicity for field laboratory work, and so the decision was made to use this solvent exclusively. Perhaps something was lost in so doing, but it is noted that Swanholm et al. (1960) state that the "information obtained by digestion with Prollius fluid appeared insufficient to warrant continued use."

Visual estimation of the amount of precipitate formed from the extract by a reagent seemed to be the most suitable method for field work. This method was used by Webb (1949) and Swanholm et al. (1959). A review of these works, and of those of Henry (1929) and Bamford (1947), indicated that some alkaloids do not precipitate with some reagents. For example, betaine and caffeine do not show a precipitate with Mayer's reagent. Moreover, because no one reagent is specific for alkaloids, it was decided to use a selection of reagents, seven in all. While this is a greater number than is usually employed for such testing, the extra work involved was negligible.

The following reagents were chosen: Mayer's (potassio-mercuric iodide), Dragendorff's (bismuth-potassium iodide), Hager's (picric acid, 1% aqueous), Wagner's (iodine in potassium iodide), Sonnenschein's (phosphomolybdic acid), Scheibler's (phosphotungstic acid), Marme's (cadmium-potassium iodide).

In a series of preliminary tests on plant material known to be positively and negatively alkaloidal, the reagents appeared to work satisfactorily.

For the extraction of saponins boiling water was used. The extract was filtered, cooled, and subjected to the froth test. The extract was then made alkaline with sodium carbonate and again subjected to the froth test. The Liebermann-Burchard test was applied for further confirmation in some cases.

METHODS USED

1. *Extraction of Alkaloids*

Fifty ml of dilute hydrochloric acid (1% aqueous) were placed in a 250-ml beaker on a

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controlled-temperature hot-plate and maintained between 70° and 80°C. Sufficient chopped tissue to make a loose slurry (about 4–5 gm) was added to the acid and the temperature was maintained for 2 hours, with occasional stirring. The hot liquid was then filtered off and cooled. This gave 15–20 ml of fluid for testing.

In the main, leaf and stem tissue was used, although in some cases other parts of the plant were available.

2. *Testing for Alkaloids*

Four drops of the acid extract were placed in a watchglass and 2 drops of the reagent were added. The contents were mixed by gentle agitation and left for 10 minutes. The amount of precipitate formed in each watchglass was then estimated visually and a rating recorded for each. The ratings used were as follows:

0–no precipitate.
1–slight precipitate; usually requires close examination to see.
2–medium precipitate; readily discernible, although not prolific.
3–heavy precipitate; abundant.
4–extra-heavy precipitate; very flocculant, filling whole area covered by liquid.

After some experience, it was possible to disregard those precipitates which looked peculiar. For example, Wagner's reagent usually gave red or reddish precipitates and any other colours were suspect.

The plant material was extracted and tested as soon as possible after removing it from its parent plant. The normal delay was not greater than 48 hours, but in a few cases it was 96 hours.

3. *Extraction of Saponins*

A small quantity (1–2 gm) of chopped tissue was placed in about 25 ml of water. The mixture was brought to the boiling point and then allowed to cool for about 4 hours. The resulting extract was then filtered and the tissue discarded.

4. *Testing for Saponins*

About 10 ml of the filtered extract was shaken for about 30 seconds and allowed to stand undisturbed. The time taken for the froth, if any, to disappear was noted. If the froth persisted after 30 minutes, this was read as "saponin positive."

Another 10-ml portion of filtered extract was made alkaline with sodium carbonate and again shaken. If a froth persisted after 30 minutes, this was considered as "positive," and probably indicative of diterpene or triterpene acid.

RESULTS

Alkaloids

Using the method of estimation given above, it is clear that a maximum score of 28 is possible, and it was, in fact, obtained from some extracts. On the other hand, a score of 0 was not uncommon.

To set a score above which the plant is alkaloid positive and below which it is alkaloid negative is tempting, but this would simplify the interpretation. If a plant shows some precipitate in all seven reagents, then it very likely contains alkaloid, perhaps only in small quantities due to the season of the year or to the locality in which it was growing.

Unfortunately, phosphomolybdic and phosphotungstic acids are not as selective for alkaloidal substances as could be desired. In extreme cases the total score obtained for a plant was made up from its reaction to only these two reagents. This clearly rates as alkaloid negative, because there was no precipitate formed with any of the other reagents. In future surveys of this type, these two reagents could well be omitted without great loss. However, in Table 1 the precipitate scores from these two reagents have been included.

In Table 1 the plants tested are arranged alphabetically by families. The genus and the species are given where known; otherwise the author's collection number appears, in anticipation that identification will ultimately be made at the Herbarium in Honiara.

Names in parentheses are native names. The place and month of collection are also shown, together with the score and the number of reagents which produced precipitates (for example, 12(5) means a score of 12 derived from 5 reagents). The native names have been taken from the check list by Whitmore (1964). These are by no means authoritative and are offered as a guide only.

TABLE 1

RESULTS OF TESTS FOR ALKALOIDS AND SAPONINS IN PLANTS OF THE SOLOMON ISLANDS

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
ACANTHACEAE						
Pseuderanthemum sp. (malmalohenga)	102	H, Mar	22(7)	—	+	
Pseuderanthemum sp.	112	H, Mar	17(6)	—	—	
Eranthemum sp.	223	G, Aug	18(6)	—	—	
Graptophyllum sp.	232	P, Sep	15(7)	—	—	
Clerodendron inerme	228	B, Sep	20(7)	—	—	
ALANGIACEAE						
Alangium javanicum	176	M, Jul	5(2)	—	—	
AMARANTACEAE						
Amarantus sp.	183	MA, Jul	24(7)	+	+	
Amarantus sp.	263	V, Dec	18(7)			
ANACARDIACEAE						
Semecarpus sp.	198	W, Aug	0(0)	—	—	
Mangifera sp.	251	CE, Apr	5(3)	—	—	
Mangifera indica leaf	258	G, Dec	1(1)	—	—	
bark			2(2)			
APOCYANACEAE						
Cerbera cf *floribunda* (aitongatonga)	122	SL, Apr	3(2)			purple
Thevetia peruviana leaf	136	H, May	1(1)	—	—	
Alstonia spectabilis leaf	137	H, May	15(7)	—	—	
bark			24(7)			
Alstonia scholaris	156	H, Jun	18(7)	—	—	
cf *Alyxia*	203	H, Aug	5(5)	—	—	
ARACEAE						
Monsteria sp.	214	H, Aug	15(7)	—	—	
ARALIACEAE						
Polyscias (baro bara)	208	H, Aug	10(5)	+	—	
Delarbia collina	213	H, Aug	5(2)	—	—	
Unknown	289	SL, May	5(4)			
ARISTOLOCHIACEAE						
Aristolochia sp.	282	P, May	15(7)	—	—	
Aristolochia tagalla	168	SL, Jun	7(5)	—	—	
ASCLEPIADACEAE						
Dischidia sp.	115	H, Mar	5(2)			
Hoya sp.	301	G, Jun	2(2)			
BIGNONIACEAE						
Spathodea campanulata	284	H, May	3(2)			
BORAGINACEAE						
Cordia subcordata	299	V, Jun	2(1)	+	—	
Carmona retusa	276	W, Apr	0(0)	—	—	
Unknown	303	G, Jun	15(7)	—	—	
BURSERACEAE						
Canarium sp.	287	SL, May	4(3)	—	—	

TABLE 1 (*continued*)

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
CASUARINACEAE						
Casuarina sp.	157	H, Jun	6(4)			
COMBRETACEAE						
Terminalia sp.	101	H, Mar	12(6)	—	—	
Terminalia catappa	192	Giz, Jul	3(2)	—	—	
COMPOSITAE						
Mikana scandens (komboro)	135	H, Apr	2(2)			
Wedelia biflora	169	SL, Jun	3(2)	—	—	
Wedelia biflora	190	Giz, Jul	9(4)	—	—	
Corchorus sp.	171	SL, Jun	3(3)	+	+	pink
Emilia sonchifolia	179	M, Jul	15(7)	—	—	
Vernonia sp.	293	H, Jun	2(2)	+	+	
Mikania cordata	307	SL, Aug	18(7)	—	—	
CONVOLVULACEAE						
Ipomea pes-caprae	111	G, Mar	7(4)			
Merremia pacifica var. *ooststeroom* (tambui)	181	M, Jul	9(6)	—	—	
Unknown	292	H, Jun	3(3)	—	—	
CUCURBITACEAE						
Trichosanthes sp.	252	CE, Apr	12(7)	—	+	
Unknown	302	G, Jun	3(2)	—	—	
DIOSCORIACEAE						
cf *Dioscorea*	128	MtA, Apr	2(1)	—	+	
Dioscorea sp.	278	H, Apr	12(7)	+	—	
EUPHORBIACEAE						
Acalypha sp.	100	H, Mar	21(7)	—	+	green
Homolanthus novoguineensis	279	M, Apr	5(3)	—	+	
cf *Breynia*	212	H, Aug	1(1)	—	—	
Croton sp.	264	H, Jan	16(6)			
Euphorbia sp.	162	G, Jun	4(3)	—	—	
Breynia cernua	234	G, Sep	11(5)			
Breynia cernua	246	W, Oct	24(7)	—	—	
Macaranga tanarius	154	H, Jun	9(6)	—	—	
Macaranga tanarius (female)	206	G, Aug	3(2)	—	—	
Macaranga mecostylis	210	H, Aug	14(6)	—	—	
Macaranga aleuritoides	161	B, Jun	7(5)	—	—	
Ricinus sp.	235	G, Sep	20(7)	—	—	
Securinega samoana	291	Auk, Jun	5(3)	—	+	
Exoecaria agallocha	273	W, Mar	4(3)	—	—	
Manihot utilis leaf	151	M, Jun	15(7)	—	—	
(bia) fruit			17(7)			
Securinega samoana	256	G, Nov	9(4)	—	—	
Mallotus sp.	253	CE, Nov	16(7)	—	+	
Unknown	298	V Jun	7(3)	+	+	
FLAGELLARIACEAE						
Flagellaria indica leaf	173	SL, Jun	14(6)	—	—	
fruit			12(7)			

TABLE 1 (*continued*)

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
GOODENIACEAE						
Scaevola lutescens	164	G, Jun	9(5)	+		red
Scaevola cf *taccada*	257	G, Nov	5(3)	—	—	
LABIATAE						
Leucas lavandulifolia	166	SL, Jun	9(6)	+	—	purple
Unknown	200	W, Aug	4(2)	—	—	
LAURACEAE						
Persea americana	119B	H, Mar	11(7)	—	—	
Cassytha filiformis	216	V, Aug	20(7)	—		
LEGUMINOSAE						
Crotalaria sp. leaf	105	G, Mar	28(7)	—	—	
part-ripe seeds			26(7)			
Tephrosia sp.	109	G, Mar	18(7)	—	—	
Erythrina sp.	118	H, Mar	18(7)	—	—	
Mucuna sp. leaf	123	SL, Apr	19(7)	—	—	
(koisahri) dry fruit			28(7)			
Desmodium polycarpon	142	SL, May	1(1)			
Cassia alata	143	P, May	0(0)			
Canavalia sp.	145	H, May	13(7)			
Centrosema plumierii	153	M, Jun	16(7)	—	—	
Centrosema sp. leaf	155	P, Jun	16(7)			
fruit			21(7)			
Mimosa cf *invisa*	158	G, Jun	9(6)	—	+	
Tephrosia cf *noctiflora*						
leaf	159	G, Jun	14(7)	—	—	
fruit			23(7)			
Canavalia sp.	160	G, Jun	17(7)	—	—	
Uraria lagopodioides	170	SL, Jun	9(6)	—	+	—
cf *Derris*	174	SL, Jun	0(0)			
cf *Desmodium* sp.	180	M, Jul	8(5)	—	—	
Delonix regia	187	H, Jul	25(7)			
Desmodium umbellatum	188	H, Jul	12(5)	—		
Intsia bijuga	222	H, Aug	17(7)	—	—	
Unknown	227	B, Sep	13(6)	—	—	
cf *Dalbergia*	229	G, Sep	15(7)	—	—	
Crotalaria sp.	233	G, Sep	20(7)	—	—	
Unknown	236	B, Sep	16(7)			
Hardenbergia sp.	237	H, Sep	12(7)	—	—	
Procopis insularium	239	W, Oct	23(7)	—	—	
cf *Derris*	242	W, Oct	15(6)	—	—	
Desmodium umbellatum	260	G, Dec	16(7)	—	—	
Poinciana gillesii	268	H, Jan	10(5)			
Cassia fistula	269	H, Jan	16(7)			
Cassia siamea	277	H, Apr	11(6)	—	+	
Lonchocarpus sp.	295	SL, Jan	5(5)	—	+	
LILIACEAE						
Cordyline fruticosa	167	SL, Jun	9(5)	—	+	—
Geitonoplesium cymosum	230	H, Sep	5(3)	—	—	
Geitonoplesium sp. leaf	261	H, Dec	7(4)	—	—	
green fruits			6(3)			
Gloriosa sp.	275	H, Apr	1(1)			
Smilax sp.	286	SL, May	10(4)	—	—	

TABLE 1 (*continued*)

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
LOGANIACEAE						
Strychnos colubrina (kwalaveko)	141		10(5)			
Fagraea racemosa	271	Giz, Jan	17(7)			
LORANTHACEAE						
Viscum sp.	133	MtA, Apr	5(2)	—	—	
MALVACEAE						
Unknown	107	G, Mar	18(7)	—	—	
Urena lobata	108	G, Mar	8(6)	—	—	
Hibiscus tiliaceus (hau)	144	H, May	18(7)	—	—	
Sida cf *rhombifolia* leaf	250	CE, Nov	21(7)	—	—	
fruit			8(3)			
Triumfetta sp.	285	SL, May	12(5)	+	—	
MELASTOMACEAE						
Melastoma polyanthum	126	SL, Apr	14(7)	—	—	
MELIACEAE						
Melia azedarach leaf	182	H, Jul	17(7)	—	—	
fruit			11(6)			
MORACEAE						
Antiarias taxicaria leaf	117	H, Mar	20(7)	—	—	
fruit			18(7)			
Artocarpus vrieseanus leaf	119A	H, Apr	17(7)	—		
cf *subsessilis* seeds			19(7)			
Ficus sp. (sakwari)	140	H, May	0(0)	—	—	
Artocarpus altilis (baleo) (rouai)	146	H, Jun	12(7)	—	—	
Ficus sp.	191	Giz, Jul	6(2)	—	—	
Ficus sp.	209	H, Aug	3(3)	—	—	
Ficus sp.	218	P, Aug	12(6)	—	—	
Ficus sp.	220	P, Aug	2(2)	—	—	
MYRISTICACEAE						
Myristica sp.	150	M, Jun	6(4)	—	—	
MYRTACEAE						
Eugenia malaccensis	175	M, May	0(0)	—	—	
Psidium guayava	266	Ten, Jan	1(1)	—	—	
Eugenia tierneyana leaf	288	SL, May	1(1)	—	—	
fruit			9(6)			
NYCTAGINACEAE						
Boerhavia sp.	255	G, Nov	10(6)	—	—	
ORCHIDACEAE						
Unknown	184	MtA, Jul	22(7)	—	—	
Unknown	199	W, Aug	1(1)			
OXALIDACEAE						
Averrhoea carambola	193	Giz, Jul	1(1)	—	—	
PALMAE						
Strongylocaryum sp. (boko)	138	P, May	0(0)			

TABLE 1 (*continued*)

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
PASSIFLORACEAE						
Passiflora foetida	215	H, Aug	4(3)	+	+	
PIPERACEAE						
Piper sp.	129	MtA, Apr	1(1)	—	—	
Piper sp.	139	P, May	0(0)	—	—	
Piper sp.	177	M, Jul	24(7)	—	—	
Piper sp.	281	P, May	12(7)	—	—	
POLYGALACEAE						
Polygala paniculata	196	Giz, Jul	18(7)	+		
RHAMNACEAE						
Gouania sp.	202	H, Aug	2(2)	—	—	
RHIZOPHORACEAE						
Carallia brachyata	231	P, Sep	12(5)	—	—	
RUBIACEAE						
Geophila herbacea	131	MtA, Apr	1(1)	—	—	
Musseanda sp. (kwalosanggus)	134	MtA, Apr	4(4)	—	—	
Uncaria sp.	148	M, Jun	19(7)	—	+	
Morinda citrifolia	163	G, Jun	7(5)	+	+	
Timonius timon	172	SL, Jun	4(3)	+	—	purple
Unknown	197	G, Jul	4(1)	—	—	
cf *Randia*	217	P, Aug	4(2)	+	—	purple
Timonius timon	226	H, Sep	3(2)	—	—	
Timonius timon	243	W, Oct	3(1)	—	—	
Timonius timon	283	H, May	1(1)	—	—	
Boerhavia sp.	255	G, Nov	10(6)	—	—	
Ixora sp.	274	H, Apr	18(7)	—	—	
RUTACEAE						
Evodia sp.	221	P, Aug	1(1)	—	—	
Micromelam minutum	240	W, Oct	20(7)	—	—	
SAPINDACEAE						
Allophylus cobbe	120	SL, Apr	1(1)	—	—	
Pometia pinnata	132	MtA, Apr		+		red/brown
Allophylus cobbe	238	G, Sep	3(2)	—	—	
SMILACEAE						
Smilax sp. (kwala'au or kwalaebo)			8(5)			
SOLANACEAE						
Solanum sp. leaf	125	G, Apr	15(7)	—	+	nil
fruit			15(7)			
Capsicum sp. leaf	280	H, May	28(7)			
green fruit			19(7)			
STERCULIACEAE						
Kleinhovia hospita (hai hai)	114	H, Mar	13(6)	+	+	
Melochia umbellata	116	H, Mar	9(6)	—	—	
Commersonia bartramia (dandame)	121	SL, Apr	9(6)	—	—	
Kleinhovia hospita	127	G, Apr	20(7)	—	+	nil
Commersonia bartramia	195	Giz, Jul	6(5)	—	—	

TABLE 1 (*continued*)

PLANT TESTED	COLLECTION NUMBER	PLACE[1] AND MONTH	ALKALOID SCORE	SAPONINS		
				WATER	ALKALI	L/B
TILIACEAE						
Triumpheta sp.	205	H, Aug	0(0)	—		
URTICACEAE						
Procris sp.	130	MtA, Apr	2(2)	—	—	
Pipturis argentius	178	M, Jul	6(5)	—	—	
Elatostemma sp.	219	P, Aug	15(7)	—	—	
Pipturis argentius	201	W, Aug	7(3)	—	—	
VERBENACEAE						
Vitex sp.	106	G, Mar	5(4)	—	—	
Stachytarpheta jamaicensis	110	G, Mar	15(5)	—	—	
Clerodendron sp. (teterau)	124	T, Apr	24(7)			
Premna corymbosa	165	G, Jun	5(2)	—	—	
Premna corymbosa	194	Giz, Jul	11(6)	—	—	
Vitex negundo leaf	254	G, Apr	12(4)	—	—	
bark			9(4)			
Tectona grandis	267	H, Jan	20(7)	+	—	
Gmelina arborea	272	H, Mar	15(7)	—	+	
VITACEAE						
Leea sp. leaf	113	H, Mar	3(1)	—	—	
(bora bora) fruit			2(2)			
Cayritia sp.	207	H, Aug	2(2)	—	—	
Cayritia sp.	224	H, Aug	10(7)	—	—	
Leea sp.	245	W, Oct	3(3)	—	—	
ZINGIBERACEAE						
Tapeinochilus sp.	185	MtA, Jul	15(7)	—	—	

[1] Abbreviations used for places: P–Poha River, Guadalcanal; SL–Skyline Rd., Guadalcanal; MtA–Mount Austen; H–Honiara; G–Guadalcanal Island; M–Matanikau River, Guadalcanal; T–Tetare; B–Benigi; W–White River, Guadalcanal; CE–Cape Esperance; V–Visale; Giz–Gizo Island; Auk–Auki, Malaita Island; Ten–Tenaru.

Saponins

For convenience, results of the tests for saponins have been included in Table 1 under three headings:

Water Alkali L/B

In the water and alkali columns, "+" means froth lasting for more than 30 minutes, and "—" indicates either no froth at all or froth having a persistence of less than 30 minutes. A blank in any column indicates that no test was done. In the L/B column the colour obtained is given. Blues are suggestive of steroids, whereas reds suggest triterpenoids.

SUMMARY AND DISCUSSION

The number of families represented by the specimens tested is 54 (within the limits of identification available).

Alkaloids

The following 32 families contain species which give positive tests for alkaloids. In this assessment, any score considered marginal has been recorded as positive. However, families represented by only one species have not been included unless the test is clearly positive. The first figure is the number of samples found positive, and the second figure is the number tested.

Acanthaceae	5/5
Amarantaceae	2/2
Apocyanaceae	2/5
Aracaceae	1/1
Aristolochiaceae	1/2
Boraginaceae	1/3
Combretaceae	1/2
Compositae	2/7

Cucurbitaceae	1/2
Dioscoraceae	1/2
Euphorbiaceae	9/18
Flagellariaceae	1/1
Labiatae	1/2
Lauraceae	2/2
Leguminosae	23/30
Loganiaceae	2/2
Malvaceae	4/5
Melastomaceae	1/1
Meliaceae	1/1
Moraceae	4/8
Nyctaginaceae	1/1
Orchidaceae	1/2
Piperaceae	2/4
Polygalaceae	1/1
Rubiaceae	2/11
Rutaceae	1/2
Solanaceae	2/2
Sterculiaceae	4/5
Urticaceae	1/4
Verbenaceae	6/8
Vitaceae	1/4
Zingiberaceae	1/1

It would be of value to tabulate on a percentage basis the positive alkaloid families. However, the number of species sampled per family is too small in some cases to permit this and could only lead to erroneous interpretations.

Similarly, a table to show, in descending order, the number of good alkaloidal species would also be misleading. This would show Leguminosae as the most promising whereas, in point of fact, species of Leguminosae were most prolific and easily collected.

However, one may be permitted the statistic that 58% of all families tested were alkaloid positive. This, of course, may only mean that the author was fortunate in collecting such specimens, and does not necessarily represent the ratio of alkaloidal to non-alkaloidal plants on Guadalcanal.

Saponins

The number of families represented by the specimens tested is 48 (within the limits of identification available).

The following 21 families contain species which gave positive tests for saponins. The first figure is the number of positives obtained (including L/B positives), and the second figure is the number of specimens tested in each family.

Acanthaceae	1/5
Amarantaceae	1/2
Apocyanaceae	1/5
Araliaceae	1/3
Boraginaceae	1/3
Compositae	2/6
Cucurbitaceae	1/2
Dioscoraceae	2/2
Euphorbiaceae	5/15
Goodeniaceae	1/2
Labiatae	1/2
Leguminosae	4/21
Liliaceae	1/4
Malvaceae	1/5
Passifloraceae	1/1
Polygalaceae	1/1
Rubiaceae	4/11
Sapindaceae	1/2
Solanaceae	1/1
Sterculiaceae	1/3
Verbenaceae	2/6

Of the total families tested for saponins, 42% gave a positive result either from water or alkali or the L/B test. In some cases the L/B test failed to show any colour, and these have been recorded as negative. In one case only (Apocyanaceae) was the L/B test positive when both the water and the alkali froth tests were negative.

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